

tary prolan in blood and urine, signifying complete or almost complete cessation of ovarian function, as Doctor Fluhmann pointed out nearly a decade ago, and now his finding that this pituitary fraction may be made to disappear by an adequate dosage of estrin, are extremely important from many standpoints. Some of the most alarming vasomotor disturbances involving cardiac rate and rhythm marked vacillating changes in blood pressure and bizarre edemas may be handled more effectively in the light of these findings. Proper dosage in such patients is all-important, as many have received inadequate treatment, without relief, over a long period of time.

MUSCLE GRAFTS: IN THE SURGERY OF THE HEART AND LUNGS*

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PEDICLED muscle grafts have been employed in surgery for a variety of purposes. Credit is given for such a graft by Wangenstein¹ for the closure of a persistent duodenal fistula, as well as for filling up a cavity in the femur, following curetment of a bone cyst. Dixon,² McNealy and Shapiro³ recommend the employment of viable muscle grafts for the plugging of or reinforcing the suture lines in wounds of large blood vessels. Reid⁴ believes that pedicled muscle flaps may be of value in the obliteration of aneurysmal sacs of blood vessels.

Abrasanoff⁵ is accredited as the first to suggest and employ successfully a pedicled muscle graft in the closure of a bronchial fistula.

We have employed viable muscle grafts for the closure of bronchial fistulas, chronic empyema cavities and, in one instance, such a graft was successfully utilized in filling up a cavity resulting from an infection in a thoracoplasty wound.

PEDICLED MUSCLE GRAFTS AS TRANSPLANTS

It would appear correct, therefore, to assume that pedicled muscle grafts are worthy transplants. They seem certainly to have a peculiar faculty to resist digestion, either from the ferments of secretion or suppuration.

The fairly recent suggestion by Beck⁶ and the actual employment by him of a pedicled muscle flap to provide a new blood supply to the heart (the latter being impoverished because of coronary thrombosis or sclerosis, in many human cases), brings us to the question of the fate of such muscle transplants. Churchill⁷ but recently, in a discussion on the use of transplants to close bronchial fistulas, stated it was his opinion that a muscle graft functioned merely temporarily as a plug, that the graft does not permanently fill the cavity in the sense that a dentist fills a tooth, but the graft is slowly absorbed and replaced by fibrous tissue.

The literature is sufficiently stocked with discussions upon the technical methods in the handling of

pedicled muscle grafts and their clinical application, but there is a decided paucity in the histologic study of the end result. It became our advantage to study at necropsy a pedicled muscle graft which had been utilized to close the remains of a lung abscess cavity, as well as several bronchial openings, some two years before. In this instance the graft could still be grossly distinguished from the surrounding lung parenchyma; it had remained viable and had filled up what had been a considerable hole in the left lower lobe. Fibrous tissue had replaced the striated muscle for the most part, but histologically many striations were still visible. Furthermore, there were many large blood vessels, both in the substance of the graft itself and running along the surface of the graft, connecting the visceral surface of the lung to the chest wall. It was the pathologist's opinion that these large vascular connections accounted for the machine-like murmur which was audible over the region of the graft before death.

BLOOD SUPPLY OF GRAFTS

Pedicled muscle grafts would seem, therefore, to retain their bulk and viability indefinitely and, in addition, will survive in a comparatively unfavorable environment. The experimental studies of Pool and Garlock⁸ further substantiate this conclusion. The final problem under discussion is that which concerns the effectiveness of such a graft as a conveyor of new blood supply. O'Shaughnessy⁹ is of the opinion the great omentum would serve as the best means to provide blood to an ischemic heart, and cites convincingly the manner in which the omentum has been seen to nourish a large fibroid of the uterus, or again the Talma operation, where the omentum is utilized to shunt the portal blood through other channels. Mautz and Beck¹⁰ recently concluded that adipose tissue has been most promising for developing new arterial connections with the coronary arteries, in their hands. These authors utilized pericardial and mediastinal fat and omentum, and are of the opinion that these fatty tissues develop connections with more regularity than when skeletal muscle is used. They further state that frequently pedicled muscle grafts are disappointing, because the pedicles become converted into scar tissue and an abundance of collateral channels fail to develop. However, in several instances, they report that excellent collateral connections were observed between the coronary arteries and the arteries of the chest wall, via the subternal muscles.

At the present time, sufficient information is not available to state whether the anastomoses through grafts can exceed the size of the normal collaterals of the heart. However, observations indicate that in the late stages of coronary arterial obstruction blood actually flows into the heart through the extracardiac connections, since it is only in severe coronary arterial obstructions that these vessels have been seen to persist and enlarge.

OMENTUM

It appears likely, from the foregoing brief discussion, that the omentum is probably superior to the pedicled muscle graft as a conveyor of new blood supply. Certainly there is not the danger of atrophy in the omental transplant which will occur

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TABLE 1.—*Muscle Plasties*

Type of Lesion	Total	Result			Mortality
		Healed Per Primam	Second Intention Closure	Failure	
Lung abscess with bronchial fistula	7	5	2	0	0
Infected echinococcic cyst	1	1	0	0	0
Chronic empyema with bronchial fistula	4	2	1	1	1
Chronic empyema without bronchial fistula	4	2	2	0	0
Tuberculous empyema	2	0	0	2	0
Postoperative infection in thoracoplasty wound	1	0	1	0	0
Total	19	10	6	3	1

in muscle when there is interference with the nerve supply, or even the venous circulation. Brooks,¹¹ in his study of Volkmann's ischemic paralysis, has demonstrated beautifully the ease with which muscle tissue can be transformed to a mass of fibrous tissue when there is marked obstruction to venous return. In the human patient, whether the added complication of opening the diaphragm will outweigh the apparent advantages of the omental graft for new blood supply, will have to be determined by the clinical experience of the future.

ISCHEMIC HEARTS

It is our regret that we have nothing more to add to the present reported experimental results regarding the use of muscle grafts to provide an increase of circulation to an ischemic heart. We feel our experience with fourteen dogs, treated in a similar manner to those of Beck and his associates, simply confirms the findings of these investigators. Their experiments have been so thoroughly and clearly presented that a repetition of the results of our small group would be superfluous. The gains from our work we feel in a sense to be purely personal. Repeated experience in surgery upon the heart of the experimental animal seems to acquaint one with the problems that will occur in the human patient, and one enters the operating room with that comfortable feeling that he has been there before.

BRONCHIAL FISTULAS

We have been satisfied with the results obtained in the use of muscle flaps to close bronchial fistulas, which latter have persisted following the drainage of a lung abscess. It is our custom to delay the plastic closure until the patient is free from cough, and the healing lung is pink and healthy. The bronchial openings are anesthetized with 10 per cent cocaine solution and the muscle flaps are then sewn

snugly into the depression of the lung containing the fistulas. We take care to leave an adequate base to the muscle flap so that the muscles receive a satisfactory blood supply. Usually the nerves supplying the flap are not seen, and we make no serious effort to locate them. Since the base of the flap is customarily that portion attached to the chest wall, it is probable the nerve supply is usually intact.

OTHER DISEASES

Our results in chronic empyema of the nontuberculous type are also encouraging, and it is our intention to use muscle flaps more frequently in the treatment of this condition in the future. The two failures which occurred (Table 1) in the cases of tuberculous empyema suggest that perhaps this is one environment which is unfavorable to the muscle graft.

We have employed the muscle graft to provide a new blood supply to the heart in only one patient. This patient was 62 years of age, and had been suffering from almost constant anginal pain, the pain being present even while the patient was at rest. The operative procedure was carried out with very little shock to the patient but, unfortunately, he developed bronchopneumonia soon after surgery and expired on the third postoperative day. The omentum has been employed by us in another human case, a man of 42 years of age, who was suffering from intractable angina, with electrocardiographic evidence of coronary sclerosis. It has been but four weeks since his operation, and of course it is too early to tell the result of the procedure. It may be said, however, that the postoperative convalescence has been serene and not eventful up to date.*

* This patient died suddenly while walking on the street, approximately five months after operation. There had been little change in his condition since operation. It would seem correct to assume that omentopexy in this particular patient produced neither subjective nor objective improvement.

TABLE 2.—*Statistics of Beck and O'Shaughnessy*

Total Cases Operated	Mortality	Absolutely and Completely Relieved of Pain	Pain Relieved Less Drugs Some Working	Slight Relief	No Improvement	Too Early to Definitely Classify But All Are Improved
Beck—1937 25	8—32%	3	9	1	1	3
O'Shaughnessy—1938 15	5—33+ %	6	3		1	

Table 2 shows the latest published results of Beck¹⁰ and O'Shaughnessy.¹² Both authors are encouraged by their results, chiefly, I believe, because of the striking improvement in several of their patients.

SUMMARY

In summary, it is our belief that the following conclusions can be accepted concerning the subject under discussion.

1. Pedicled muscle grafts are worthy transplants; they retain their bulk over long periods of time, and they resist the ferments of secretion and suppuration. They are particularly useful in the closure of persistent bronchial fistulas.

2. The omentum is probably superior to the pedicled muscle graft as a conveyor of new blood supply.

3. Sufficient operations, employing either the pedicled muscle graft or the omentum, have been carried out upon the human to provide increased circulation to an ischemic heart, with encouraging results to warrant further trial with these procedures.

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DISCUSSION

ALBERT H. ELLIOTT, JR., M. D. (1421 State Street, Santa Barbara).—The field for the application of elective surgical procedures in the attempt to influence chronic progressive disease processes is, of late years, appreciably widening. Conditions heretofore regarded as residing strictly in the realm of medical therapy—hypertension, heart disease, for example—are in an experimental and tentative way being subjected to surgical intervention, which usually has, as its goal, one of two purposes, namely, to alter presumably abnormal physiological process by surgical attack upon anatomically normal structures, or to produce an abnormal physiologic state which might serve to ameliorate that resulting from the disease process itself. Splanchnic section for the treatment of hypertension is an example of the former; total thyroidectomy for heart disease, of the latter. The internist is watching these attempts with great interest, but not without some misgivings as to the soundness of the underlying premises

upon which these procedures are based. There can be no doubt that many times the patient is symptomatically improved to the extent that he may even resume a fairly normal degree of activity—a result impossible of achievements by medical means alone. But the evidence would seem to indicate that in most instances the disease process itself is not stopped, or even slowed. This is particularly true of total thyroidectomy for the treatment of heart disease, and one cannot help but be chary of superimposing a disease state—myxedema—upon that already present. In my opinion these criticisms do not apply to the operation devised by Beck and his collaborators for the treatment of coronary insufficiency. That operation has a healthy experimental background which, as you have heard today, can be verified by other workers. The mechanism of coronary strangulation expressing itself in man as angina pectoris and coronary occlusion can be experimentally closely mimicked in the dog. It has been shown unequivocally that if the myocardium is partially starved for blood, vascular connections between the heart and extracardiac tissues can be established in as short a period of time as three weeks, if the subepicardial surface of the heart and the tissue bridge are in close contact. The amount of blood flowing into the myocardium through such a graft must be considerable, as the coronary blood supply may be almost, but not entirely, throttled, and the animal not only survive, but be active. Probably also the graft serves to distribute blood from healthy to ischemic myocardium. The sequence of events here—impaired coronary supply, vascular invasion of the myocardium through the graft, then coronary closure—is worthy of emphasis as it suggests that not only may a chronically insufficient coronary circulation be augmented, but also that acute coronary occlusion, ordinarily fatal, may be borne (by virtue of this), with impunity. In essence, then, this procedure constitutes not only a remedial attack upon the existing circulatory insufficiency, but perhaps insures against the catastrophe of acute coronary blockage. It would seem that the patient most likely to benefit from this operation would be the sufferer from angina pectoris—coronary narrowing—whose myocardium is yet intact, but who is certain, as I believe all such patients are, barring accidents, to develop coronary thrombosis at a future date. This type of patient is an extremely common therapeutic problem to the internist, who feels a sense of defeat as he gauges the prognosis. To judge from the protocols of Beck and O'Shaughnessy, most of their patients had suffered one or more occlusions before the operation was attempted. It is obvious that bathing a fibrous myocardium in blood would accomplish but little, hence it is surprising that their results are as good as they appear to be. I feel sure they would be better in a series of patients in whom the disease process had reached a stage analogous to that existing in the experimental animals at the time of operation. It will be extremely interesting to watch this group of operated patients. Will their lives be prolonged, and will they survive coronary occlusion in the future? Will their coronary disease progress without clinical evidence—occlusion without infarction? Will the anastomotic blood channels remain viable and patent? In this regard, the observations, by Doctors Stephens and Benteen, of patent blood channels in a graft two years old is both heartening and important.

It has been a privilege to listen to a paper dealing with a new surgical principle, the application of which is sure to find a place in the treatment of such a common and devastating malady as coronary disease.

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PAUL C. SAMSON, M. D. (411 Thirtieth Street, Oakland).—Doctors Stephens and Benteen have outlined the subject under discussion in a very thorough manner. The thoracic surgeon, perhaps oftener than any other, is confronted with the problem of repairing large defects in body contour. Various types of plastic operations, combined with the use of muscle grafts, have been employed successfully for many years. The only recent addition to this field is the suggestion of Neuhoof (*J. Thor. Surg.*, 7:23, 1937), that free fat transplants be used. So far as I know, this work has not been confirmed. The exposition of technique is not within the scope of this discussion, except to say that, depending upon the location of the defect, great ingenuity often must be exercised by the surgeon in the

selection and treatment of his muscle graft. The constant presence of low-grade infection and of a rigid bony cage, add to the difficulties. Because of the infection, free muscle plugs cannot be used. It is absolutely essential that a pedicled muscle graft, with an adequate blood supply, be obtained, if a "take" is to be expected. The authors have indicated the various possibilities in using muscle grafts in infected fields. It is not unexpected that the presence of a mixed tuberculous and pyogenic infection prevented a good result in the author's cases. The recent report by Coryllos (Quart. Bull. Sea View Hosp., Jan., 1938), however, that he has closed tuberculous cavities in the lung by a muscle plasty, should be studied further.

In considering the surgical creation of a collateral blood supply in cardiac ischemia, there will be further controversy, undoubtedly, as to whether the omental or the skeletal muscle transplant is superior. The experimental work both of Beck and O'Shaughnessy seems to be extremely sound. In a series of autopsies I found that in several cases the omentum was too short to be pulled up through the diaphragm without greatly angulating the large bowel. For this reason I have hesitated to use the omental transplant on a patient. The Beck operation still carries considerable risk, and experiments now are being performed to see if it may be possible to divide the operation into stages. I have done pectoral muscle transplants to the myocardium (Beck operation), on two patients. The first patient was a man of sixty-two, referred by Dr. Mark Emerson of Oakland. In the past, several abdominal operations had been performed because of persistent epigastric pain. He also complained of severe intermittent chest pain with radiation down the left arm. Investigation revealed definite evidence of coronary sclerosis and probable old myocardial infarction. Operation was performed on December 13, 1937. The coronary arteries were thickened and palpable, and a large myocardial scar was present in the anterior wall of the heart near the apex. The post-operative course was stormy. At present the patient can be classified as improved, as far as his chest is concerned. He has no residual chest pain but the abdominal difficulties have continued, and their etiology is unknown.

The second patient was a woman of sixty-two years of age, referred by Dr. Hobart Rogers of Oakland. She had had two definite coronary attacks, one seven years, and one seven months prior to operation. She had been confined to bed almost continuously since the last attack. There was no evidence of congestive heart failure, but the patient was obviously a poor surgical risk. Operation was performed on March 14, 1938, and death occurred on the second postoperative day. An important finding at autopsy was the relatively firm adherence of the graft to the surface of the myocardium.

GERIATRICS*

A CONTRIBUTION OF TWENTY-FIVE CAREFULLY STUDIED PATIENTS WHO ARE ACTIVE AND IN GOOD HEALTH BEYOND EIGHTY YEARS OF AGE

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GERIATRICS is the study or practice of the science of caring for the aged. A review of the literature teaches that this is not only an old science, but that the many scientific contributions in recent years have made it an interesting and rapidly broadening field in the practice of medicine.

MATERIAL FOR THIS STUDY

The present study has been carried on for the past two years, and is a preliminary report, presented with the hope that it will stimulate interest in

the field of geriatrics, and possibly encourage some helpful suggestions as further case studies are made and added to the series. This series presents twenty-five cases—thirteen men and twelve women—active and in good health in the ninth decade of life. The studies include, in each case, careful medical, dietary and social history, physical examination, blood count, urinalysis, electrocardiogram and fluoroscopic examination of the chest. I am perfectly aware that in such a small number of cases statistical data are inaccurate, and I am also aware that, in the many facts sought after in these detailed histories, we have no controls by which to judge our deductions. However, we hope to increase the number in this series from time to time and, by a careful recording in the literature, our general deductions can be reaffirmed and revalued. This has been admirably brought out in our recent studies of the literature in this field, for on many important points all of the authors are agreed.

HISTORICAL

Longevity has always been a subject of interest to mankind. Herodius,¹ in his history written in the fifth century before Christ, refers to the presence of longevity among a milk-eating people. Cicero² wrote on the subject of old age, as well as did Sir Francis Bacon.³

In more recent times, Metchnikoff,⁴ who has contributed extensively to scientific knowledge, brought out in the field of geriatrics, a book entitled "The Prolongation of Life." Unfortunately, he made an unconfirmed conclusion, namely, that longevity was dependent upon the type of intestinal flora present. Doctor Lorand,⁵ of Carlsbad, in 1909 claimed to be the earliest writer on the prophylaxis and treatment of old age as a preventable chronic disease. He believed that old age was due to degeneration of the ductless glands, and that these could be favorably influenced by therapy.

Gallichan,⁶ an English writer, in 1929 contributed to the field and emphasized that "overwork, worry, pecuniary anxiety and boredom are all important contributing factors of untimely aging and senescent invalidism."

Worcester,⁷ in his unusually able lectures, has described the "Care of the Aged." He emphasized the psychological handling of these patients, and set forth the four cardinal hygienic requirements of senescence as "More warmth, more rest, less work and less food." He stated that diagnostic studies should be brief and simple, and at times entirely disregarded, and that these patients often need the friendly support more than the medical aid of their physicians.

Pepper,⁸ in 1936, carefully outlined in his "Notes in the Field of Geriatrics" the differences between senescence, or the normal physiological aging, and senility, or the abnormal pathological aging, and suggested that disease in old age differs in many ways from disease in other periods of life; these differences being the basis upon which the science of geriatrics is developed.

Horn,⁹ in 1937, in "Geriatrics as a Modern Specialty," pointed out that between the years of 1900 and 1930 there was an increase of 52 per cent in

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